

# **Childhood Anemia: a comprehensive clinical approach**

**DR. SAJID RAHMAN  
TMO**

**DEPARTMENT OF PEDIATRICS  
GREEN LIFE MEDICAL COLLEGE**

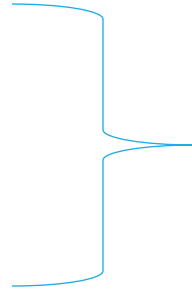
**DR. FATEMA TUJ JOHORA  
REGISTRAR**

**DEPARTMENT OF PEDIATRICS  
GREEN LIFE MEDICAL COLLEGE**

# SCENARIO 1

**A 11 months old child presented at Pediatric OPD with complaints of:**

- **Not growing well**
- **Reluctant to feed &**
- **Recurrent infection**



**since 8 months of age**

**On Examination:**

- **Pallor: severe**
- **Anthropometric measurement:**
  - **moderately wasted (weight for length z score  $< -2$ )**

**This presentation suggests Malnutrition with nutritional anemia, (iron deficiency anemia) requiring comprehensive evaluation and management**

## SCENARIO 2

A 2 years old boy presented with complaints of:

- Not growing well
  - Gradual pallor
  - Recurrent infection
  - An increasing mass over left upper abdomen
- since 7 months of age
- ❖ The child has H/O repeated blood transfusion since 1 year of his age

On Examination:

- Pallor: severe
- Jaundice: mild
- Hepatosplenomegaly present

The history of repeated transfusions with organomegaly suggests hereditary hemolytic anemia, most likely thalassemia major requiring ongoing supportive care

## SCENARIO 3

**A 4 years old girl presented with complaints of:**

- **Anorexia**
- **Habit of eating non food substances (dirt, plaster of wall, paper) for last 6 months**
- ❖ **Dietary history: she is picky eater with low intake of fish, chicken, vegetable & fruits**

**On Examination:**

- **Active playful child**
- **Pallor: moderately pale**
- **Anthropometric measurement: undernourished (low weight for age)**
- **Neurological examination: normal**

**This case demonstrates classic iron deficiency anemia with pica behavior, requiring nutritional counseling and iron supplementation**

# INTRODUCTION

- ☐ **Anemia is the most common hematological abnormality affecting >1.6 billion population globally, mostly young children, menstruating adolescent girls & women, pregnant & post-partum women**
- ☐ **Low & lower-middle income countries bear the greatest burden of anemia**
- ☐ **In severe cases, anemia leads to delayed growth, cognitive impairment & reduced immunity in growing children**



# Global Impact of Childhood Anemia

**1.6 billion**  
Population  
Affected globally

The most common  
hematological  
abnormality  
worldwide

**60%**  
of causes of  
anemia are  
preventable &  
treatable

# PREVALENCE

- ☐ The prevalence varies widely between countries, the highest burden seen in underdeveloped & developing countries
- ☐ Very few nationwide studies were conducted in BD on prevalence of this problem
- ☐ Majority of studies were institution based

# RESEARCH LANDSCAPE IN BANGLADESH

**The prevalence of childhood anemia varies widely between countries, with the highest burden observed in underdeveloped and developing nations**

## Current research status

- Limited nationwide epidemiological studies
- Most research is institution-based
- Need for comprehensive population surveys

## Research challenges

- Resource limitations
- Geographic accessibility
- Standardization of diagnostic criteria

**This research gap highlights the need for more comprehensive studies to guide effective public health interventions & policy development in Bangladesh**

# PREVALENCE

According to National surveillance project (NSP) BD

| YEAR | AGE GROUP           | ANEMIA PREVALENCE |
|------|---------------------|-------------------|
| 2004 | 6 months – 5 years  | 64%               |
| 2016 | 6 months – 5 years  | 51.9%             |
| 2023 | 6 months – 18 years | 46.8%             |

The data shows a encouraging downward trend in childhood anemia prevalence over the past two decades, indicating successful public health interventions. However, the rates remain significantly high, with nearly half of children still affected in 2023.

# WHO Global Surveillance Data for Age Group 6 months – 5 years

| YEAR | AGE GROUP          | PREVALENCE |                 |
|------|--------------------|------------|-----------------|
| 2011 | 6 months – 5 years | 42.6%      | Africa          |
|      |                    | 42%        | south east Asia |
| 2019 | 6 months – 5 years | 39.8%      |                 |
| 2024 | 6 month – 5 years  | 40%        |                 |

Global trends show modest improvement in childhood anemia prevalence, with regional variations reflecting socioeconomic disparities & healthcare access differences across continents.

## ANEMIA - DEFINITION

❑ Anemia is defined as reduction in hemoglobin concentration below the normal for age, sex & race of the individual

| AGE                    | HEMOGLOBIN RANGE  |
|------------------------|-------------------|
| newborn (0-4 weeks)    | 13.4 – 19.9 gm/dl |
| 6 months to 1 year     | 11.3 – 14.1 gm/dl |
| 12 – 18 years (male)   | 14.5 gm/dl        |
| 12 – 18 years (female) | 14.0 gm/dl        |

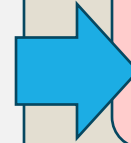
# WHO GRADING OF CHILDHOOD ANEMIA

**Mild anemia: Hb 10 – 10.9 gm/dl**



**Often asymptomatic,  
detected by routine tests**

**Moderate anemia: Hb 9.9 – 7 gm/dl**



**Symptomatic with fatigue,  
pallor, exercise intolerance**

**Severe anemia: Hb < 7 gm/dl**



**Life threatening, needs  
urgent medical intervention**

**This standardized classification system guides clinical decision-making regarding urgency of treatment, need for hospitalization & monitoring requirements for pediatric patients with anemia**

# COMMON CAUSES OF CHILDHOOD ANEMIA



## Morphological classification

Based on RBC size & appearance under microscopy



## Etiological/clinical causes

Organized by underlying cause & clinical presentation, guiding targeted diagnostic workup & treatment

## **1. MICROCYTIC ANEMIA:**

- Iron deficiency anemia (IDA)
- Thalassemia
- Anemia of chronic inflammation
- Sideroblastic anemia
- Anemia due to lead poisoning

## **2. MACROCYTIC ANEMIA:**

- Vitamin B12 & Folic acid deficiency
- Aplastic anemia
- Chronic liver disease
- Hypothyroidism

## **3. NORMOCYTIC ANEMIA**

- Hemolytic anemia (hereditary spherocytosis, Autoimmune hemolytic anemia)
- Anemia of chronic disease
- Anemia due to bleeding
- Bone marrow infiltration by malignancy: ALL, Lymphoma
- Bone marrow suppression by: Infection (Malaria), drugs & chemicals
- Autoimmune disorder: JIA, SLE

**Childhood Anemia**  
**Common causes**  
**(in BD)**

```
graph TD; A([Childhood Anemia  
Common causes  
(in BD)]) --- B([Nutritional anemia  
(IDA, Vit B 12 & Folic  
acid deficiency)]); A --- C([Parasitic infestation  
(hook worm,  
Schistosomiasis)]); A --- D([Hereditary  
hemolytic anemia  
(Thalassemia)]); A --- E([Infections:  
Malaria, Kala-azar]); A --- F([Bone marrow  
disease:  
Acute leukemia, Aplastic  
anemia]); A --- G([Anemia of  
chronic diseases]);
```

**Nutritional anemia**  
(IDA, Vit B 12 & Folic  
acid deficiency)

**Parasitic infestation**  
(hook worm,  
Schistosomiasis)

**Hereditary  
hemolytic anemia**  
(Thalassemia)

**Infections:**  
Malaria, Kala-azar

**Bone marrow  
disease:**  
Acute leukemia, Aplastic  
anemia

**Anemia of  
chronic diseases**

## **Childhood Anemia in BD: most common causes**

**Iron deficiency  
anemia  
(64.5%)**

**Congenital hemoglobin  
disorder (28%)**

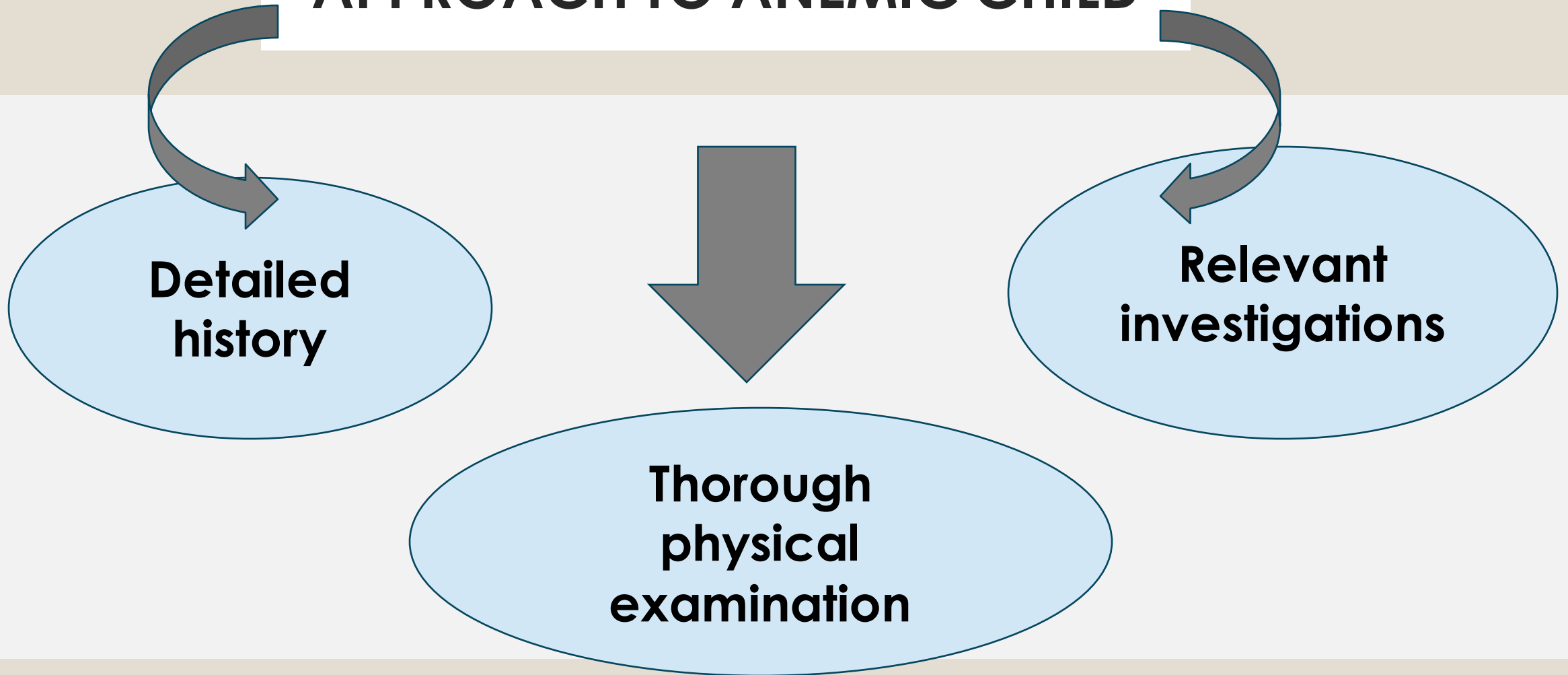
**Others**



**Hb E trait  
(82.35%)**

**This breakdown shows the predominant causes of childhood anemia in clinical practice, with iron deficiency being the leading cause, followed by hemoglobin disorders, particularly Hb E trait in Bangladesh**

# APPROACH TO ANEMIC CHILD



# EVALUATING A CHILD WITH ANEMIA – HISTORY

## Nutritional anemia:

- Birth history: maternal anemia/malnutrition during pregnancy
- PT-LBW
- Feeding history

## HHA:

- Family history: H/O consanguinity, other sibs with similar problem
- H/O repeated blood transfusion

## Bone marrow disease:

- Pallor
- Bleeding
- Fever

# **Childhood anemia - manifestations**

# FEATURES SUGGESTIVE OF IDA



**Easy  
fatiguability**



**Growth  
retardation**



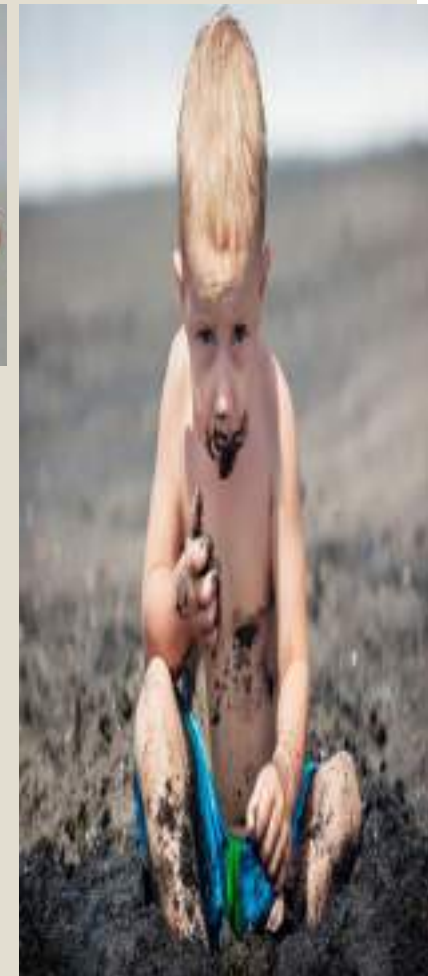
**Poor  
concentration**



**Pallor**



**Smooth  
glossitis**



**Pica**

# FEATURES SUGGESTIVE OF THALASSEMIA



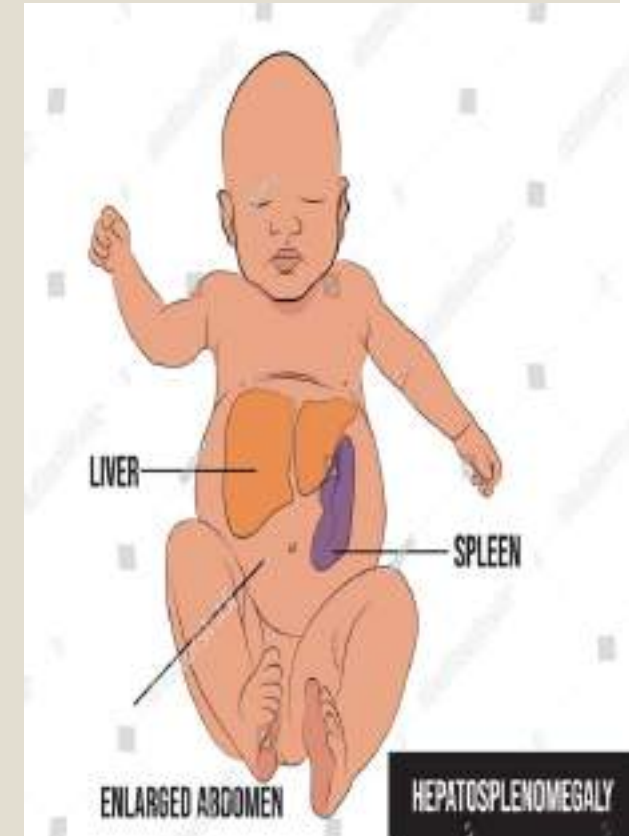
**Thalassemic  
facies**



**Pallor**



**Jaundice**



**Hepatosplenomegaly**

# FEATURES SUGGESTIVE OF BONE MARROW DISEASE



**Pallor**



**Bone pain**



**Lymphadenopathy**



**Hepatosplenomegaly**



**Bleeding**

# EVALUATION OF A CHILD WITH ANEMIA - INVESTIGATIONS



# INVESTIGATIONS – IRON DEFICIENCY ANEMIA

## COMPLETE BLOOD COUNT WITH PBF

- Hb: low
- RBC count: low
- RBC INDICES:
  - MCV
  - MCH
  - MCHClow
- Reticulocyte count: N/L
- PBF: Hypochromic microcytic, anisopoikilocytosis, pencil shaped cells & nucleated RBC

## IRON PROFILE

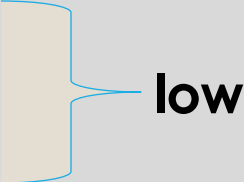
- Serum Iron:
  - Serum ferritin:
  - % saturation of iron:
  - TIBC: raised
- 

## OTHERS

- Stool for OBT
- Others

# INVESTIGATIONS – THALASSEMIA

## COMPLETE BLOOD COUNT WITH PBF

- Hb: low
- RBC INDICES:
  - MCV
  - MCH
  - MCHClow
- Reticulocyte count: increased
- PBF: Hypochromic microcytic, anisopoikilocytosis, pencil shaped cells & nucleated RBC

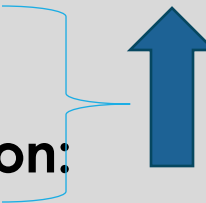
## Hb ELECTROPHORESIS

- HbA<sub>1</sub>: markedly reduced
- HbA<sub>2</sub>: normal
- HbF: markedly increased

## X RAY SKULL

- Increased diploic space, hair on end appearance

## IRON PROFILE

- Serum Iron:
  - Serum ferritin:
  - % saturation of iron:
  - TIBC: low
- 

# **INVESTIGATIONS – BONE MARROW DISEASE**

- 1. Complete blood count with PBF**
- 2. Bone marrow study**

# **CHILDHOOD ANEMIA - TREATMENT**

**Treatment according to cause**

# TREATMENT OF IDA



**Dietary advice**



**Iron replacement  
therapy**



**Blood transfusion**

## DIETARY ADVICE

- **EBF up to 6 completed months of age**
- **Appropriate complementary feeding practice**
- **Intake of iron rich foods**
- **For pre term low birth weight babies: iron supplementation from 6 weeks of age up to 6 months of age**

# Iron replacement therapy

## Oral iron therapy

- Ferrous fumarate/sulphate/gluconate

Formulation: syrup, capsule

DOSE: 3 - 6 mg/kg/day, 2 divided doses

- Duration of Rx: Nearly 4-6 months iron replacement is required

# Intravenous iron therapy in pediatrics: Who should get it and when is the right time

## Patients and Etiologies

### "Classic" Iron Deficiency Anemia (IDA)

- Young children, nutritional IDA
- Adolescent females, heavy menstrual bleeding

### Iron Deficiency & Inflammation

- Gastrointestinal Conditions
- Heart failure
- Chronic kidney disease

### Other ID/IDA Patient Presentations

- Severe IDA +/- active bleeding
- Symptomatic low ferritin

## Initial Therapy

Oral iron

IV iron

Oral iron

VS

IV iron

## Additional Considerations

Assess  
Response at  
one month

Appropriate response  
Poor response

Oral iron

IV iron

Address  
underlying  
inflammation

**IV iron formulations  
approved in pediatrics**

- Low molecular weight iron dextran
- Ferric gluconate
- Iron sucrose
- Ferric carboxymaltose

### Decision-making:

- Adherence
- Bleeding
- Risks/Benefits

**Any case of persistent, refractory,  
or recurrent IDA → IV iron**

# CHILDHOOD ANEMIA - TREATMENT

## Thalassemia



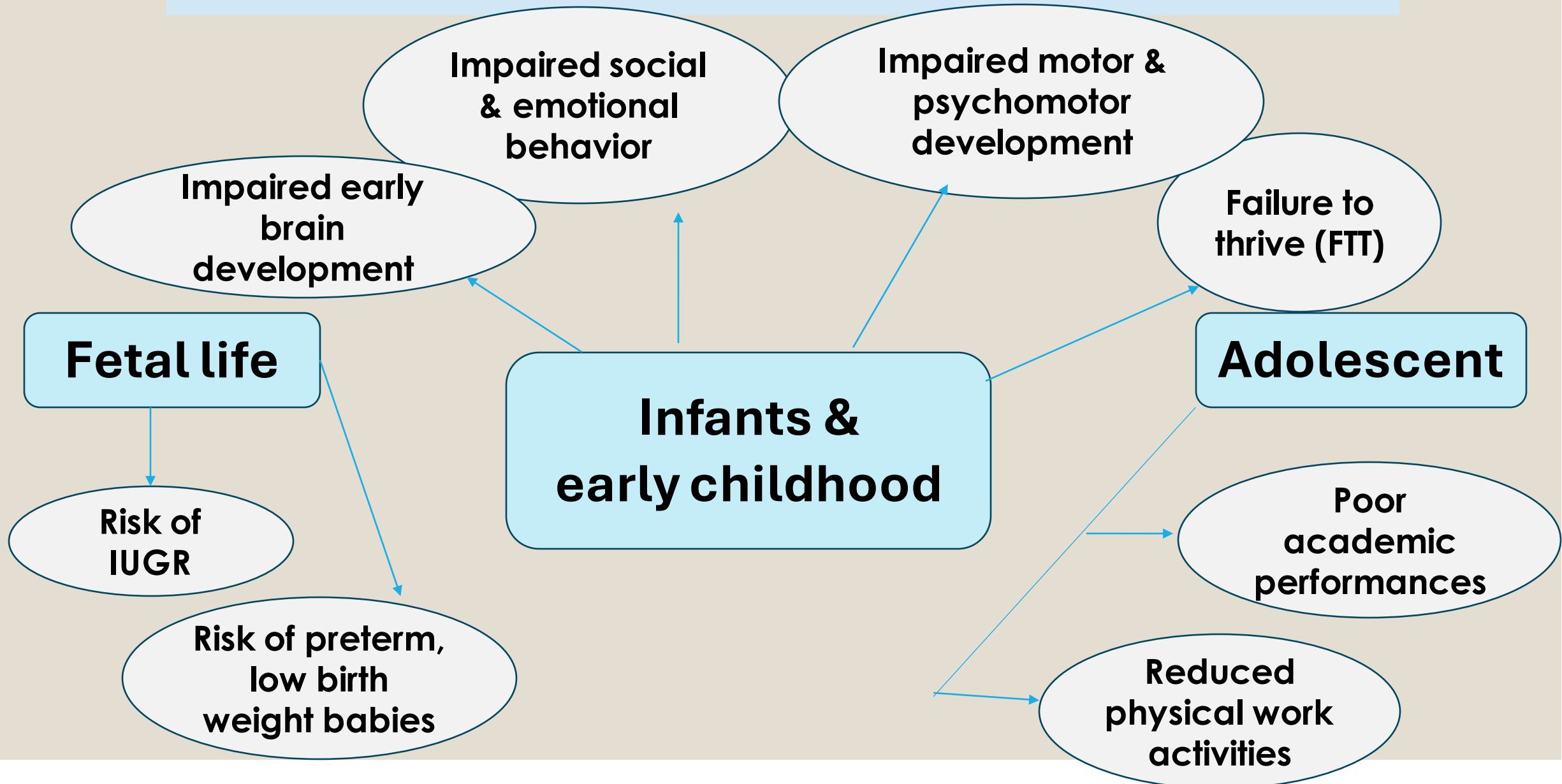
- Genetic counseling
- Regular Blood transfusion with Iron chelation
- Restrict iron rich foods
- Drug Rx
- Splenectomy
- Bone Marrow Transplantation (definitive Rx)

## Suspected BM disease



- Counseling
- Symptomatic & supportive Rx
- Chemotherapy
- Bone marrow transplantation
- Treatment of complications

# CONSEQUENCES OF CHILDHOOD ANEMIA



# **Combating Childhood Anemia in Bangladesh**

# **NATIONAL STRATEGIES ON PREVENTION & CONTROL OF MICRONUTRIENT DEFICIENCY IN BD:**

## **Target population**

**Under 5 children**

**School aged  
children**

**Adolescent  
girls**

**Pregnant &  
Lactating mothers**

```
graph TD; S1["SUPPLEMENTATION<br/>(I, FA, vit B12, Zn, Vit A)"] --- C; S2["DEWORMING<br/>(24 months-59 months)"] --- C; S3["FOOD FORTIFICATION<br/>(Iron & Vit A with salt, rice,<br/>cooking oil)"] --- C; S4["DIETARY DIVERSIFICATION<br/>(Iron & Vit c rich food)"] --- C; S5["IMPROVING<br/>MATERNAL HEALTH"] --- C; S6["REDUCING INFECTIONS<br/>(reduce parasitic infestation)"] --- C; C((NATIONAL STRATEGIES))
```

**NATIONAL STRATEGIES**

**SUPPLEMENTATION**  
(I, FA, vit B12, Zn, Vit A)

**DEWORMING**  
(24 months-59 months)

**REDUCING INFECTIONS**  
(reduce parasitic infestation)

**FOOD FORTIFICATION**  
(Iron & Vit A with salt, rice,  
cooking oil)

**IMPROVING**  
**MATERNAL HEALTH**

**DIETARY DIVERSIFICATION**  
(Iron & Vit c rich food)

# ***THALASSEMIA – Prevention & Control***

***Population education & awareness***

***Carrier detection through mass screening***

***Pre marital screening & discourage marriage between carriers***

***Genetic counseling of those who are test positive for carrier***

***Offer antenatal screening tests among carrier couples during pregnancy***

# TAKE HOME MESSAGE

## **Global Public Health Priority:**

**Anemia represents a significant global health challenge with disproportionate burden on children in developing countries, requiring urgent public health attention & resource allocation**

## **Iron deficiency dominance:**

**Iron deficiency anemia remains the leading cause of childhood anemia worldwide, making nutritional interventions the cornerstone of prevention & treatment strategies**

# TAKE HOME MESSAGE

## **Long term developmental impact:**

**Unrecognized & untreated anemia leads to irreversible developmental delays, learning difficulties, immunosuppression & poor academic performance in pediatric populations**

## **Prevention through screening:**

**Routine health screening, especially in high-risk populations, enables early detection and treatment, preventing long-term complications & optimizing childhood developmental outcomes**



**THANK YOU**